

Appl. No. 09/919,994
Amdt. dated Jan. 25, 2005
Reply to Office Action of December 15, 2004

REMARKS/ARGUMENTS

Reconsideration of this application is respectfully requested.

Claims 1-5, 7-12, and 14-30 are pending in the application, with claims 6, 13, and 31 having been canceled, claims 1, 3, 5, 7, 8, 27, 29, and 30 having been amended, and claims 14-26 and 28 having been withdrawn.

Entry of these amendments is respectfully requested as it is believed they put the application in condition for allowance or in better condition for appeal.

Claims 1-5, 7-12, 27, and 29-31 have been rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. According to the Examiner:

"... The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Adequate support has not been provided for the claims, as amended."

Specifically, according to the Examiner:

"Firstly, support has not been provided for the claimed basis for the weight percent of unreacted diisocyanate monomer. Also, it is unclear that support exists for applicants' 'exclusively' amendment."

Support for the claimed basis for the weight percent of unreacted diisocyanate monomer appears in the specification on page 18, lines 9-13 and page 42, lines 16-19. The claims have also now been amended to clarify that this is the weight percent of unreacted diisocyanate monomer "after stripping".

In the response to the previous Office Action, the claims were amended to recite the term "exclusively" in order to point out with particularity that any and all solvents added to the initial diphenylmethane diisocyanate monomer had boiling points about 1°C to about 100°C below the boiling point of the diphenylmethane diisocyanate monomer at a pressure of 10 torr. Since the Examiner is unsure of the support for "exclusively", the claims have now been amended to read "... in one or more inert solvents, said solvent or solvents being selected from the group consisting of solvents having a boiling point about 1°C to about 100°C below the boiling point of the diphenylmethane diisocyanate monomer at a pressure of 10 torr, ...", which, it is submitted, clarifies the intended meaning.

"Secondly, within claim 1, support has not been provided for treating the residual diphenylmethane diisocyanate as claimed.

As drafted, steps A) through D) of claim 1 treat the residual monomer that remains after the initial monomer has been reacted to form a prepolymer; however, the specification only provides support for treating the initial monomer in the manner claimed. Note that "the diphenylmethane diisocyanate monomer" within line 4 of the claim refers to the residual

monomer within lines 1 and 2 of the claim."

The claims have been amended to clarify that the solvent(s) are there from the beginning of the process, i.e., the initial diphenylmethane diisocyanate monomer is dissolved in one or more solvents and these solvent(s) remain in the process to aid in the removal of unreacted monomer after the reaction has been completed.

"Thirdly, within claims 5 and 27, the claims specify a process wherein the unreacted or excess monomer is treated by dissolution within solvent and reaction with a polyol; however, this process of treating the unreacted or residual monomer is not supported by the specification. It is noted that the claims specifically state that the unreacted or excess monomer is removed by the recited process steps."

Again, the claims have been amended to clarify that the solvent(s) are there from the beginning of the process, i.e., the initial diphenylmethane diisocyanate monomer is dissolved in one or more solvents and these solvent(s) remain in the process to aid in the removal of unreacted monomer by distillation after the reaction has been completed.

"Lastly, despite applicants' response, support for amending the molecular weight of the high molecular weight polyol to be number average molecular weight has not been found within at page 14, lines 3-4 of the specification. Page 14, lines 3-4 of the specification reads, 'were only used for aliphatic

diisocyanates that generally have low boiling points and provide prepolymers having greater thermal stability than those provided by aromatic'."

The undersigned regrets that the citation to the specification in the response to the previous Office Action was in error. The paragraph in question should have read:

"The claims have been amended to specify that the molecular weights of the high molecular weight polyols are number average molecular weights. Support for this amendment may be found in the specification on page 16, lines 20-21."

Accordingly, it is requested that the rejection of claims 1-5, 7-12, 27, and 29-31 under 35 U.S.C. 112, first paragraph, be withdrawn.

Claims 5, 7-12, and 30 have been rejected under 35 U.S.C. 102(b) as being anticipated by Schnabel et al. (U.S. Patent No. 4,385,171).

Schnabel et al. disclose the removal of unreacted diisocyanate from a polyurethane prepolymer reaction product mixture by co-distillation of the unreacted diisocyanate with a compound which is at least partially miscible with the prepolymer and which boils at a temperature greater than the boiling point of the diisocyanate. It is said that a highly efficient removal rate is achieved in that the concentration of unreacted diisocyanate remaining in the reaction product mixture is generally less than about 0.1 percent, and in many cases less than about 0.05 percent, based on the weight of the prepolymer.

Schnabel et al. teach that the compound used in the co-distillation of the unreacted diisocyanate should be used in an amount from about 1 to about 15 percent, and preferably from about 2 to about 8 percent, based on the total weight of the prepolymer. See column 3, lines 21-25.

The present claims have been amended to recite that the weight ratio of the inert solvent or solvents to the initial unreacted diphenylmethane diisocyanate monomer ranges from about 75:25 to about 35:65. Schnabel et al. nowhere disclose or suggest such a weight ratio.

Accordingly, it is requested that the rejection of Claims 5, 7-12, and 30 under 35 U.S.C. 102(b) as being anticipated by Schnabel et al. be withdrawn.

Claims 5, 9-13, and 30 have been rejected under 35 U.S.C. 102(b) as being anticipated by Dunlap et al. (U.S. Patent No. 4,888,442). It is noted that claim 13 has been canceled.

Dunlap et al. disclose a process for reducing the free monomer content of polyisocyanate adduct mixtures wherein the adduct has an average isocyanate functionality of greater than about 1.8 which comprises treating the polyisocyanate adduct mixture in the presence of 2 to about 30 percent by weight of an inert solvent, based on the weight of the polyisocyanate mixture, in an agitated thin-layer evaporator under conditions sufficient to reduce the free monomer content of the polyisocyanate adduct mixture below that level which is obtainable in the absence of a solvent.

The Dunlap et al. process contemplates only adding the inert solvent to the polyisocyanate adduct mixture. The present claims are directed to a process wherein the diisocyanate is first dissolved in the inert solvent and then the polyurethane prepolymer reaction product is formed by reaction with one or more polyols. The step of dissolving the isocyanate in the inert solvent prior to reaction is nowhere disclosed or suggested by Dunlap et al.

Further, as noted above, the present claims have been amended to recite that the weight ratio of the inert solvent or solvents to the initial unreacted diphenylmethane diisocyanate monomer ranges from about 75:25 to about 35:65 and Dunlap et al. nowhere disclose or suggest such a weight ratio.

Accordingly, it is requested that the rejection of Claims 5, 9-13, and 30 under 35 U.S.C. 102(b) as being anticipated by Dunlap et al. be withdrawn.

Claims 5, 7-12, and 30 have been rejected under 35 U.S.C. 102(b) as being anticipated by Rosenberg et al. (U.S. Patent No. 5,703,193).

Rosenberg et al. disclose a process for reducing the amount of residual organic diisocyanate monomer in a polyurethane prepolymer reaction product mixture which comprises distilling the polyurethane prepolymer reaction product mixture in the presence of a combination of *at least one inert first solvent with a boiling point below the boiling point of the residual organic diisocyanate monomer and at least one inert second solvent with a boiling point above the boiling point of the residual organic diisocyanate monomer*, at a

temperature which exceeds the vaporization temperature of the residual organic diisocyanate monomer and which is below the decomposition temperature of the polyurethane prepolymer.

The Rosenberg process requires at least two inert solvents, one having a boiling point above the boiling point of the diisocyanate and the other having a boiling point below the boiling point of the diisocyanate. The claims of the present application have been amended to require that the inert solvent or solvents employed in the practice of the present invention *all* have boiling points *below* the boiling point of the diisocyanate, i.e., the solvent or solvents are selected from the group consisting of solvents having a boiling point about 1°C to about 100°C below the boiling point of the diphenylmethane diisocyanate monomer at a pressure of 10 torr.

Rosenberg et al. nowhere disclose or suggest any benefit to be derived from the use of anything other than a combination of high and low boiling solvents and, in fact, show in Comparative Example G the unsuccessful removal of free PPDI monomer with low-boiling solvent, thereby leading away from the present invention.

Accordingly, it is requested that the rejection of Claims 5, 7-12, and 30 under 35 U.S.C. 102(b) as being anticipated by Rosenberg et al. be withdrawn.

Claims 27 and 31 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Schnabel et al. or Dunlap et al. or Rosenberg et al., each in view of Rizk et al. (U.S. Patent No. 4,624,996) or Lander (U.S. Patent No. 4,101,473).

Claim 31 has been canceled.

The disclosures of Schnabel et al., Dunlap et al., and Rosenberg et al. have been described above.

Rizk et al. disclose a heat curable one package polyurethane resin composition said to be adaptable to use for automotive seam sealing, particularly under high solids acrylic enamel paints, the composition comprising an isocyanate terminated polyurethane prepolymer the isocyanate groups of which are blocked by reaction with an oxime, and a curing agent having at least two active hydrogen atoms per molecule, such as a polyol, a polyamine, or a blocked polyamine.

Lander discloses solid particle-form, polymerizable or cross-linkable, multi-functional polymeric material containing blocked isocyanate groups wherein the blocked isocyanate groups making up the polymeric material comprise only a portion of the total isocyanate groups to produce the polymeric material, such as extrudable, thermosettable powdered blocked polyurethane (PBP). The polymeric material, such as PBP, may be manufactured by reacting a liquid reaction admixture comprising a partially blocked polyurethane prepolymer with a chain extending reactant under conditions such that the reaction admixture is reacted in dispersed form with the result that the reaction product is recoverable in solid particle-form as the PBP.

Neither Rizk et al. nor Lander supplement the deficiencies of the cited primary references discussed above. Both references simply show that it is known in the art to use reversible blocking agents, such as ketoximes, phenols, lactams, dimethylpyrazole and the like, to block the isocyanate end groups of isocyanate/polyol prepolymers. This has been

admitted by the Applicants on page 60 of the application at lines 3-5. However, it was not known in the art to block the low residual MDI prepolymers of the present invention in this way. It has been shown in Example 38 and Comparative Example S that unexpected results are obtained, e.g., higher tear strength and lower tangent delta values, when blocked prepolymers of the present invention are employed than when a comparably blocked TDI prepolymer is used. See Table 7 on page 62.

Claim 27 has been amended in a manner similar to that used in Claim 5 above. The Examiner has stated: "Product by process claims are examined as product claims. The process limitations are given patentable weight only if it has been established that the process causes the product to have different properties from the prior art product." It is respectfully submitted that in the present invention the process does, in fact, cause the product to have different properties from the prior art product. None of the cited art discloses how a prepolymer based upon MDI can be obtained having a residual MDI content of less than 0.3% and having the properties shown in Table 7. As pointed out by the Examiner, Schnabel et al. do mention MDI in general listing of diisocyanate monomers. However, all of the examples in that reference are directed to TDI and it has been shown in Table 7 that the unexpected results obtained with MDI are not obtained using TDI. Schnabel et al. were apparently unaware that such unexpected results could be obtained using MDI and did not disclose it. It is necessary that the steps employed to form the MDI-containing prepolymer be included in the claim in order to distinguish the novel prepolymer of the present invention from those known in art, which have inferior properties.


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Accordingly, it is requested that the rejection of claims 27 and 31 under 35 U.S.C. 103(a) as being unpatentable over Schnabel et al. or Dunlap et al. or Rosenberg et al., each in view of Rizk et al. or Lander be withdrawn.

In view of the foregoing, it is submitted that this application is now in condition for allowance and an early Office Action to that end is earnestly solicited.

Respectfully submitted,

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